

APPLICATION DEVELOPMENT TOOLS TREND

- Higher Proportion of End User Developed System
 - More Business Driven Analysis
 - More IS Control and Support
 - Quality to Override Productivity
 - Tool Integration to Increase
 - AI Additives Become More Common
-



PRODUCTIVITY

PERFORMANCE!

PROBLEMS!

PLANNING!



PRESENTATION OUTLINE

- I. Introduction
 - II. Market Overview
 - III. Study Findings
 - IV. Future Directions
 - V. Conclusions & Recommendations
-

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OBJECTIVES

- **Debunk Myths**
 - **Define Problem**
 - **Analyze "Solutions"**
 - **Determine Requirements**
 - **Provide Measurement Framework**
 - **Make Recommendations**
-



INSTANT MYTH DEBUNKING

- Shoemakers Children
- Hardware/Software Is Cheap
- Information Has Value
- Offices Can Be Automated
- AI Will Save Us

12/15/20

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This is particularly crucial for tax purposes, as it allows for easy verification of expenses and income.

2. The second section covers the process of reconciling bank statements with the company's general ledger. It outlines the steps for identifying discrepancies, such as unrecorded deposits or errors in recording payments. Regular reconciliation helps ensure the integrity of the financial data and prevents small errors from becoming larger issues.

3. The third part of the document addresses the need for a clear and consistent chart of accounts. This system should be designed to reflect the company's specific business activities and industry requirements. A well-structured chart of accounts facilitates the preparation of financial statements and provides a clear overview of the company's financial health.

4. Finally, the document stresses the importance of timely reporting and analysis. Management should review financial statements regularly to identify trends, assess performance, and make informed decisions. Prompt reporting also ensures that stakeholders receive accurate and up-to-date information.

12/15/20

SCOPE AND USE

- **Broad Perspection**
 - **Hardware-Software Environment**
 - **Data/Information/Knowledge**
 - **Office Productivity**
 - **Performance & Cost Justification**
 - **Planning!**
-



PERFORMANCE LEVELS

- **Hardware - Software**
 - **Human - Machine Dyad**
 - **Work Unit**
 - **Institutional**
-

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of appropriate statistical techniques to interpret the results.

3. The third part of the document focuses on the implementation of quality control measures. It describes how these measures are integrated into the data collection and analysis process to ensure the reliability and validity of the findings.

4. The fourth part of the document discusses the dissemination of research findings. It outlines the various channels and formats used to share the results with stakeholders, ensuring that the information is accessible and understandable.

5. The final part of the document provides a summary of the key findings and conclusions. It emphasizes the importance of ongoing monitoring and evaluation to ensure that the organization remains committed to its goals and objectives.

PRODUCTIVITY HIERARCHY

- **Commitment to Quality**
 - **End User Involvement**
 - **Broad Based Management**
 - **Effective Personnel**
 - **Right Tools**
-



METHODOLOGY

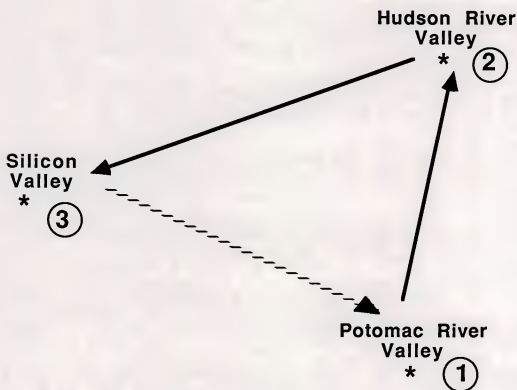
- **Interviews**
 - **Senior IS Management**
 - **Industry Experts**
 - **Integrated ADS Users**
 - **Case Studies**
 - **Desk Research**
 - **Analysis**
-

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud.

2. The second part of the document outlines the specific requirements for record-keeping. It states that all transactions must be recorded in a clear and concise manner, and that the records must be maintained for a minimum of five years. It also notes that the records must be accessible and available for review at any time.

3. The third part of the document discusses the consequences of failing to comply with the record-keeping requirements. It states that any individual or organization that fails to maintain accurate records may be subject to penalties, including fines and imprisonment. It also notes that failure to comply may result in the loss of the right to participate in the financial system.

PERSONAL CASE STUDY





RELATED INPUT REPORTS

- **"Systems and Software Productivity"**
- **"Software Development Productivity"**
- **"Impact of Office Systems on Productivity"**
- **"Relational Data Base Developments"**
- **"Market Implants of IBM Software Strategies"**
- **"Market Implants of New Software Productivity Techniques"**
- **"New Opportunities for Software Productivity Improvement"**
- **"Artificial Intelligence and Expert Systems"**
- **"Market Analysis: Data Base Management Systems"**
- **"Market Analysis: Fourth Generation Languages"**
- **"Market Analysis: Applications Development Tools"**



MARKET OVERVIEW

11. 1978

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DEFINING THE PROBLEM

- **The Problem Defines the Market**
 - **The Problem has Defied Solution**
 - **Some Solutions Contribute to the Problem**
 - **The Market Is:**
 - **Larger &**
 - **More Complex**
-

10/26/20

Dear Mr. [Name],

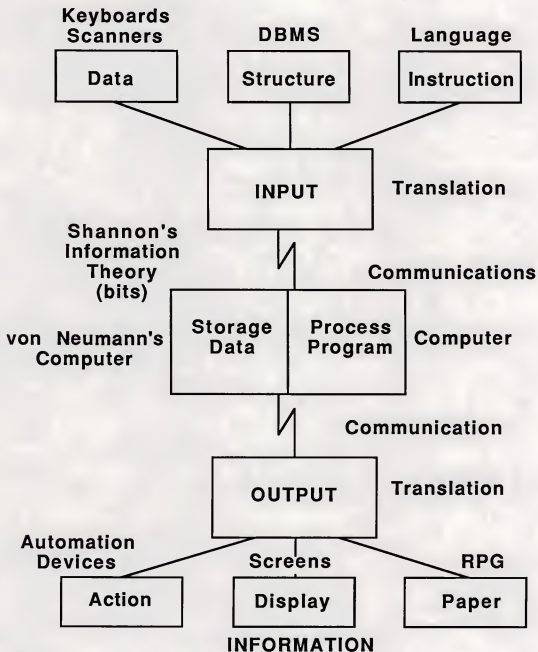
I am writing to you regarding the [Topic] that we discussed in our meeting on [Date]. I have reviewed the information you provided and I am pleased to hear that you are interested in [Topic].

[Detailed body text, mostly illegible due to blurriness]

I am sure that we can find a mutually beneficial arrangement. Please let me know if you have any questions or if you would like to discuss this further.

Sincerely,
[Signature]

A SCHEMATIC FOR EVALUATION



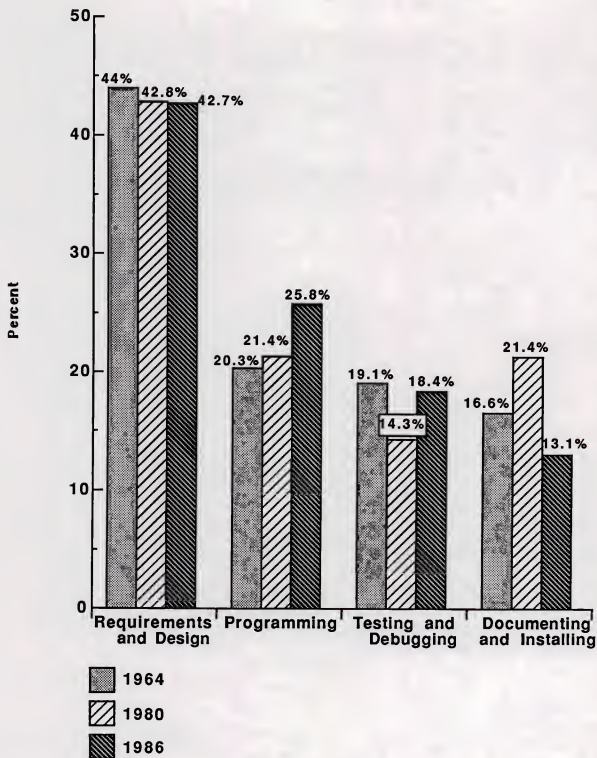


TRENDS IN SOLUTIONS

- Languages
 - 4GLs
 - FGLs
- DBMS
 - Schemas
 - Relational
- Communications
 - Internal
 - External
- Integration of Above
- Action/Automation/AI



SOFTWARE DEVELOPMENT TIME DISTRIBUTION - 1964/1980/1986





**THE PRODUCTIVITY PYRAMID
1980**





**DISTRIBUTED SYSTEMS DEVELOPMENT (DSD)
1984**

- **Data Base Integrity**
 - **File Synchronization**
 - **Hardware-Software Performance**
 - **Privacy and Security**
 - **Auditability**
-

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the specific procedures and protocols that must be followed to ensure that all records are properly maintained and updated. This includes details on how data should be collected, stored, and reviewed, as well as the roles and responsibilities of the staff involved in the process.

3. The final part of the document provides a summary of the key points discussed and offers recommendations for how the organization can best implement these procedures. It concludes by stating that the goal is to create a culture of transparency and accountability that will benefit the organization in the long run.

MEASUREMENT AND MARKET SIZE

- Productivity Not Measured By Volume
 - Markets Beyond Data Processing
 - Information Flow
 - Knowledge Workers
 - Quality, Quality, Quality
-

1890

Received of Mr. J. H. ...
the sum of ...
for ...

Total

STUDY FINDINGS



LANGUAGES

- **Cobol - Primary Language (60%)**
 - **Fortran & PL/1 (22%)**
 - **4GLs (10%)**
 - **Old Controversies Live On**
 - **A Highly Personal Issue**
-

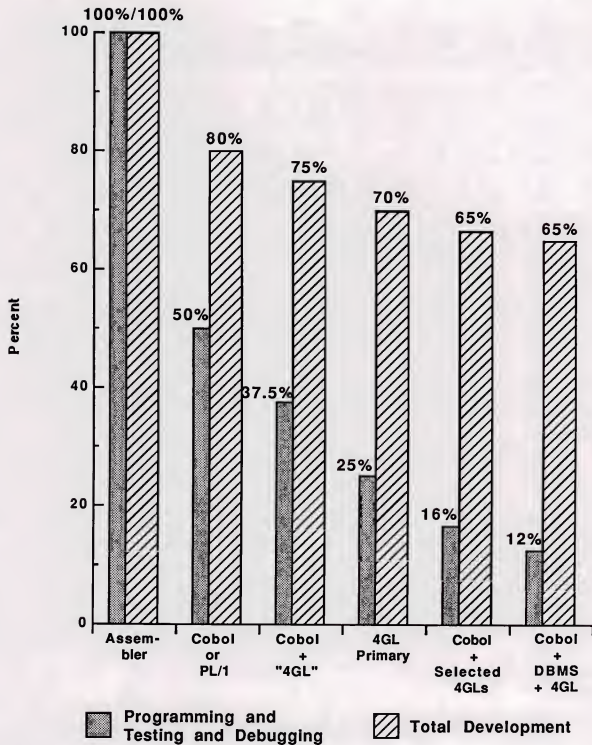


OPINIONS ON LANGUAGES

- **Languages Depend on Applications and Individuals**
 - **Generations Do Not Make Sense**
 - **Natural Languages Are "Unnatural"**
 - **Does Your Computer Have a Sense of Humor?**
-

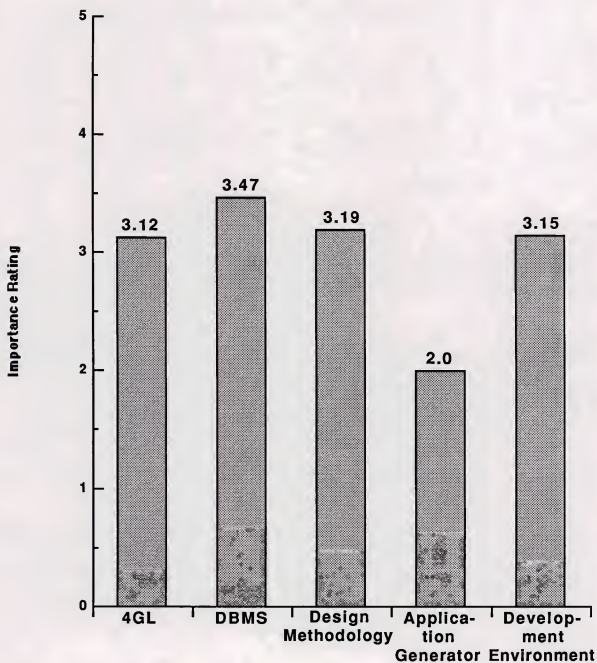


THE IMPACT OF LANGUAGES



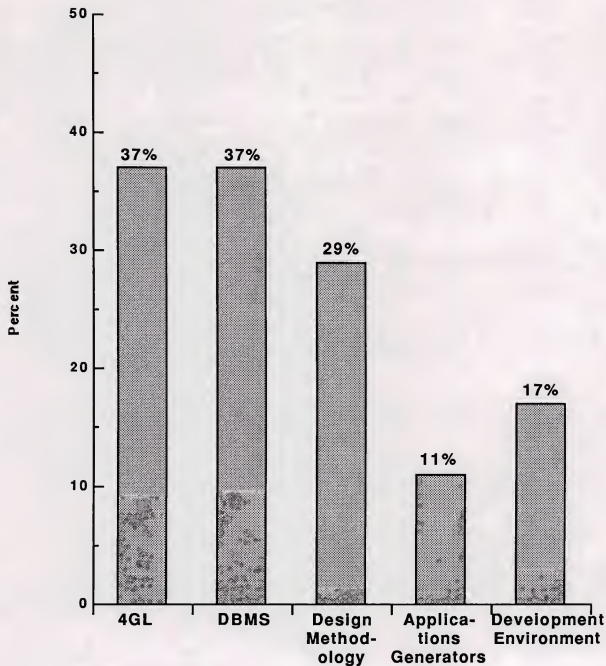


RATINGS OF IMPORTANCE OF PRODUCTIVITY TOOLS





ESTIMATED SAVINGS PRODUCTIVITY TOOLS





**OPINION CONCERNING
PERFORMANCE IMPROVEMENT
(1960s and 1970s)**

| PERFORMANCE LEVEL | IMPACT* | |
|----------------------|---------|-------|
| | 1960s | 1970s |
| Hardware - Software | -1 | -2 |
| Human - Machine Dyad | +2 | +1 |
| Work Units | +1 | +1 |
| Institutional | +1 | 0 |

* -2 = Strong Negative Impact

-1 = Some Negative Impact

0 = Neutral

+1 = Some Positive Impact

+2 = Strong Positive Impact



A FEW WORDS ABOUT DBMS

- **The Relational Model Is Important**
 - **Performance Eventually Becomes Important**
 - **Other Models Will Remain**
 - **There Are Unsolved Problems Associated with Distributed Data Bases**
-

1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It is essential to ensure that all entries are supported by proper documentation and receipts.

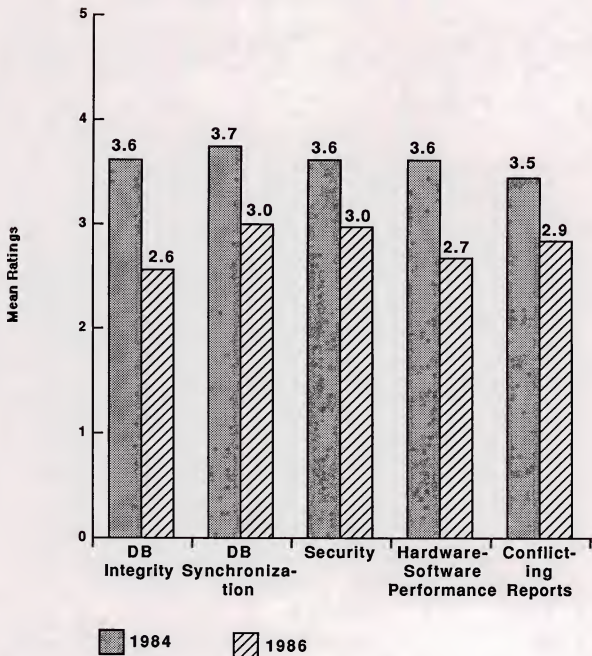
3. Regular audits should be conducted to verify the accuracy of the records and identify any discrepancies.

4. The second part of the document outlines the procedures for handling disputes and resolving conflicts.

5. It is important to establish clear communication channels and protocols for addressing any issues that arise.

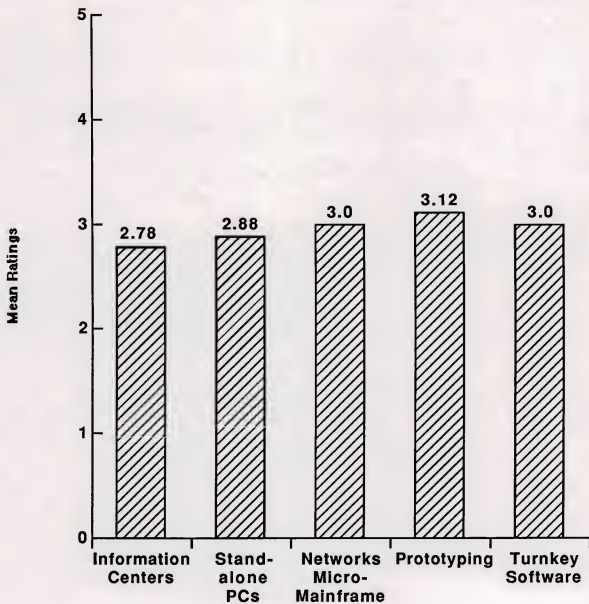
6. The final section provides a summary of the key points and offers recommendations for future improvements.

DSD PROBLEMS RATED 1984 AND 1986



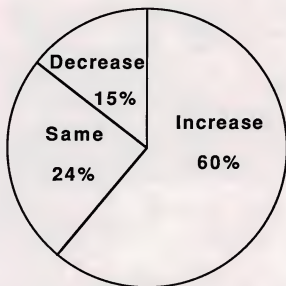


EFFECTIVE APPROACHES TO DSD

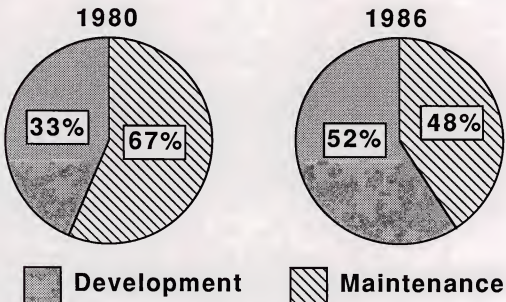




**BACKLOG ANALYSIS
(Since 1981)**





MAINTENANCE (1980 and 1986)



**PERFORMANCE IMPROVEMENT
AND DSD**

| PERFORMANCE LEVEL | IMPACT OF DSD ENVIRONMENT | |
|----------------------|---------------------------|-----------|
| | 1960s | PROJECTED |
| Hardware - Software | -2 | -2 |
| Human - Machine Dyad | ? | 0 |
| Work Units | ? | 11 |
| Institutional | ? | -1 |

* -2 = Strong Negative Impact

-1 = Some Negative Impact

0 = Neutral

+1 = Some Positive Impact

+2 = Strong Positive Impact



**CASE STUDY # 1
(Financial Institution)**

- **IBM Oriented - Hardware, Systems Software, Network**
 - **IMS, DB2, Teradata, and End User**
 - **Analysis of Alternatives a Major Effort**
 - **Hundreds of "Products" Reviewed and Installed**
 - **Data Quality a Problem**
-



**CASE STUDY #2
(UNIVERSITY)**

- **Major Enhancements to Operating Environment**
 - **Proprietary Software - DBMS and Languages**
 - **Integrated Computer/Communications Network**
 - **Office Systems Emphasis**
 - **Questions Concerning Use**
 - **"Team for Improving Productivity"**
-



**CASE STUDY #3
(Semiconductor Manufacturer)**

- **Concentration on Network**
 - **Conversion of Manual Systems to Electronic**
 - **Stated Objectives and Plan**
 - **Pyramid Seems to Fall Naturally into Place**
 - **Conventional Productivity Tools**
 - **EDI**
-



**CASE STUDY #4
(Publishing Company)**

- **Major Conversion of Tape Oriented Batch Systems**
 - **Going IMS**
 - **Using Knowledgeware**
 - **Rejected Gamma**
 - **Concerned About Performance**
 - **Concerned About Flexibility**
-



**CASE STUDY #5
(Pharmaceutical Company)**

- **Considered "Information Engineering"**
 - **Using Various Tools**
 - **Maintenance and Enhancement Emphasized**
 - **End User Involvement Stressed**
 - **Professional and Pragmatic**
 - **"Know Your Customers' Business"**
-



INPUT[®]

FUTURE DIRECTIONS



**INTEGRATED APPLICATIONS DEVELOPED
SYSTEMS (IADS)**

- **No One Solution to Problem**
 - **Mix and Match Doesn't Work Well**
 - **Current Solutions Do Not Apply to Major Applications**
 - **Need for Integrated Approach**
-



IADS ESSENTIALS

- Very High Level Language
- Meta (or Internal) Language → Various Targets
- Data and Screen Driven Reporting
- Communications Access → Various Targets
- Data Modeling → Various DBMS Targets
- Application System (Target) Independent of Development System
- Development System Capable of Addressing All Phases of Life Cycle
- Various Target Operating Environments

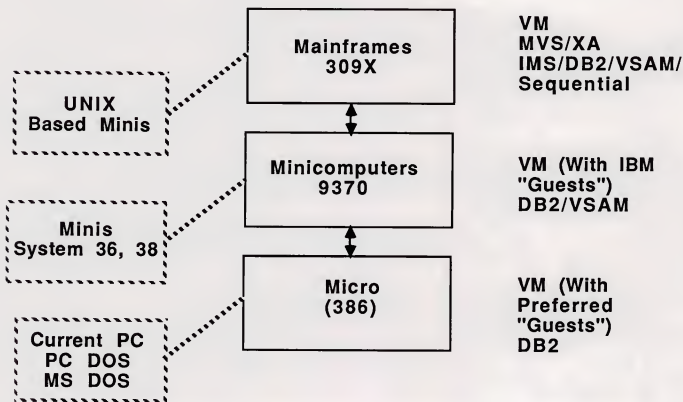


EMERGING IADS

- **APS (Advanced Programming System)
from Sage Systems**
 - **Gamma (With Knowledgeware) from
Tarkenton**
 - **Pacbase From CGI Systems, Inc.**
 - **Telon from Pansophic Systems, Inc.**
 - **Transform from Transform Logic, Inc.**
-



IBM'S PREFERRED SOLUTION





**IBM ENDORSED DDP
(Network Evolution)**

- **9370 the Preferred Environment**
 - **Evolution Still the Strategy, But Pieces Are in Place**
 - **Three Tiered Approach Finally Endorsed**
 - **Networks First and Then "Hang on Computers" Unlikely**
 - **Need for IADS within the IBM Environment**
-



MEDIA REVOLUTION

- **Our Tools Are Creating the Paper Problem**
 - **CD ROM Only the Tip of the Iceberg**
 - **A Fundamental Media Change with More Far-reaching Impacts than the PC**
 - **Beware the Lovelace Cycle**
 - **New Tools and Systems Concepts Necessary**
 - **Information Flow Control Possible**
 - **Intelligent Documents**
-



AI AND ALL THAT

- **Expert Systems Are Not Going to Solve the Systems Development Problem**
- **Domains Are Too Narrow for General Purpose Problem Solving**
- **Programmers Are Not Going to Disappear**
- **Knowledge Base ↔ Data Base Connection**
- **AI ↔ Or Links Needed**
- **Knowledge Engineering Merely Thorough Systems Analysis**
- **T³**

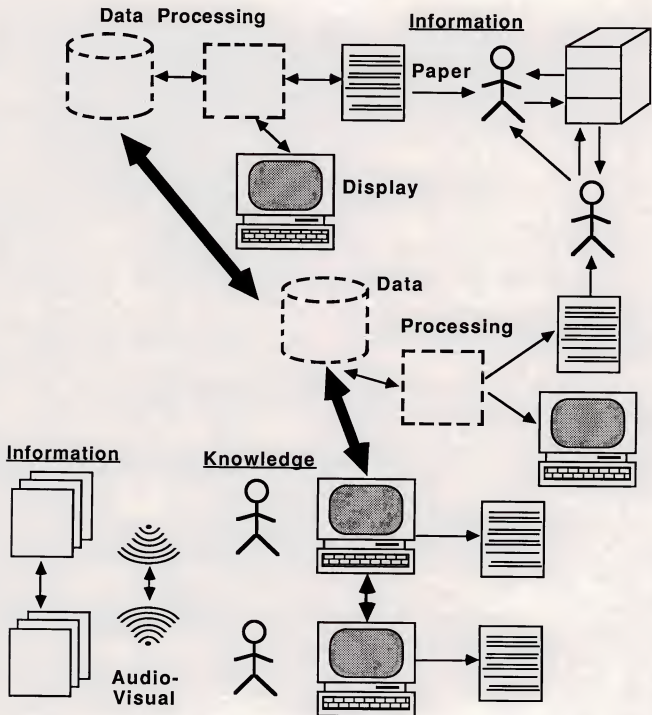


THE BRIGHT SIDE OF AI

- **Information Flow Control Monitors**
 - **Expert "Readers"**
 - **Information Analysis and Classification**
 - **Knowledge Identification**
-



THE DATA/INFORMATION/KNOWLEDGE MODEL





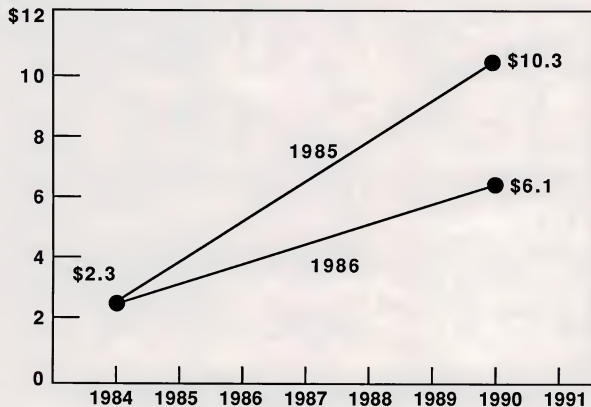
FUTURE EXPECTATIONS

| Performance Level | Commitment To Quality | End User Involvement | Broad-Based Management | Effective Personnel | Right Tools |
|---------------------------|------------------------------|-----------------------------|-------------------------------|----------------------------|--------------------|
| Hardware-Software | 1 | | | | 7 |
| Human-Machine Dyad | | 2 | | | 12 |
| Work Unit | 1 | 3 | | 4 | 5 |
| Institutional | 2 | | | | |
| Total | 3 | 5 | 0 | 4 | 24 |

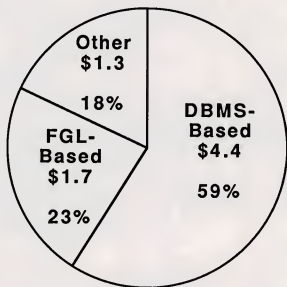


FORECAST ADTS

\$ Billions



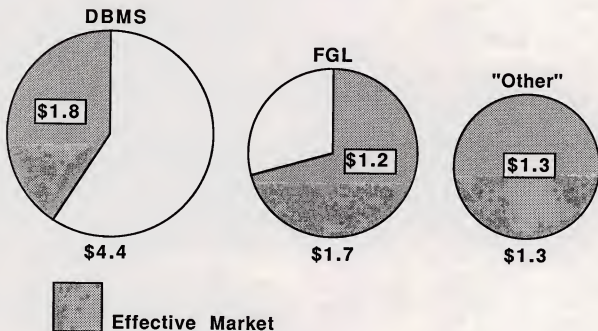


**ADT FORECAST, 1991
(\$ Billions)**

Total: \$7.4 Billion



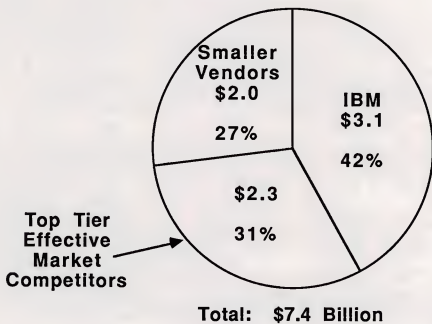
**EFFECTIVE MARKETS, 1991
(\$ Billions)**



Case

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**MARKET SHARE, 1991
(\$ Billions)**



STRATEGIC MARKET ANALYSIS

- **IBM Sets Environment and Gets Its Share**
 - **Smaller Companies Develop Innovative Products**
 - **Growth Presents Problems**
 - **Top Tier Will Face Software Productivity Problems**
-



INPUT®

**APPLICATION DEVELOPMENT
TOOLS INDUSTRY DIRECTIONS
AND FORECASTS, U.S.**

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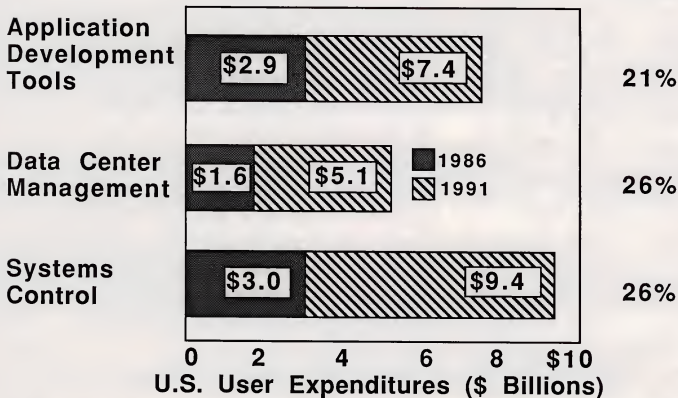
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**TOTAL SYSTEMS SOFTWARE MARKET
BY SOFTWARE TYPE, 1986-1991** **AAGR**





**APPLICATION DEVELOPMENT TOOLS
(ADT)****DBMS**

- DBMS
- Data/Dictionaries

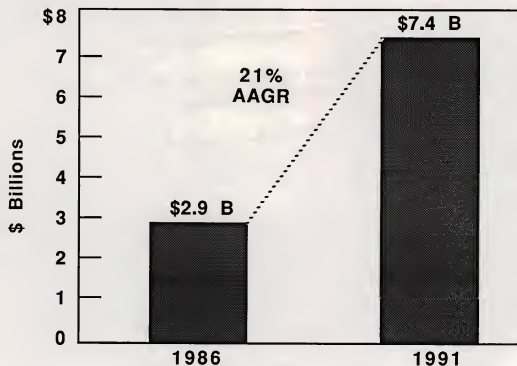
**Program
Development
Tools (PDT)**

- Application Generators
- Automatic Documentation
- Debugging Aids
- Conversion Tools
- Translators
- Retrieval Systems
- System Library Control
- Other

4GL**Other**

- Languages
 - Compilers
 - Assemblers
- Other



**APPLICATION DEVELOPMENT TOOLS
1986-1991**

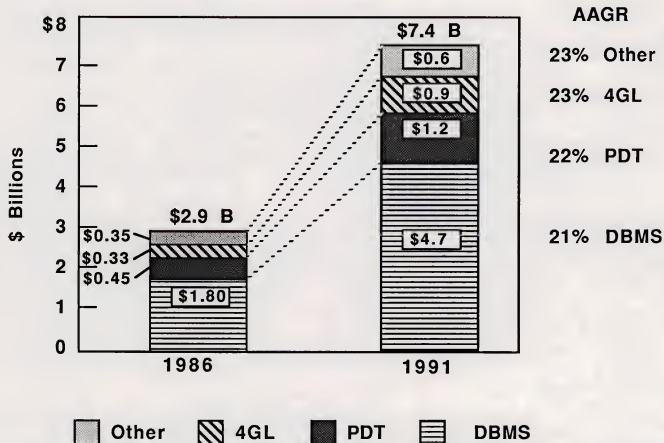


**APPLICATION DEVELOPMENT TOOLS
DRIVING FORCES**

- + Commitment to Competitive Edge Systems**
 - + Central Role of Connectivity**
 - + - IBM Emphasis on Account Control**
 - Increasing Appeal of Application Software Products**
 - + Popularity of 80386-based Micro**
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**APPLICATION DEVELOPMENT TOOLS
BY SEGMENT, 1986-1991**



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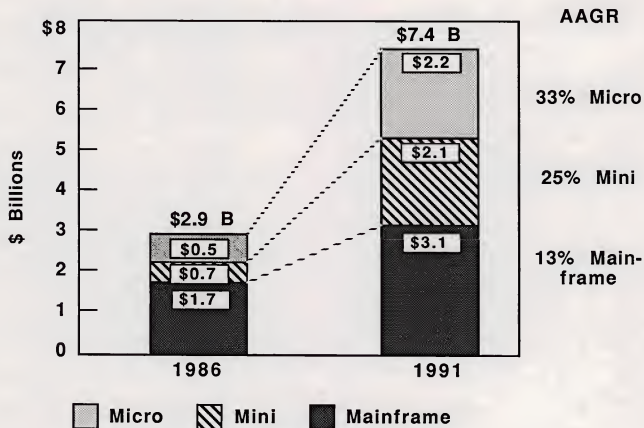
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**APPLICATION DEVELOPMENT TOOLS
BY SYSTEM TYPE, 1986-1991**



1. Introduction

The first part of the document discusses the importance of maintaining accurate records of all financial transactions. It emphasizes the need for transparency and accountability in the management of funds. The second part details the various methods used to collect and analyze data, including interviews, surveys, and focus groups. The third part presents the findings of the study, highlighting the key trends and patterns observed. The fourth part discusses the implications of these findings for policy-making and practice. Finally, the document concludes with a summary of the main points and a list of references.

2. Methodology

This section describes the research design and the data collection process. It outlines the selection of participants, the development of the interview schedule, and the procedures for data analysis. The methodology is designed to ensure the reliability and validity of the research findings.

APPLICATION DEVELOPMENT TOOLS TRENDS

- Higher Proportion of End User Developed Systems
 - More Business Driven Analysis
 - More IS Control and Support
 - Quality to Override Productivity
 - Tool Integration to Increase
 - AI Additives Become More Common
-



APPLICATION DEVELOPMENT TOOLS ISSUES

- **Degree of IS Control**
 - **Extent of Standardization**
 - **Level of Interfacing Required**
 - **Scope and Complexity of End User
Developed Systems**
 - **Viability of Distributed DBMS**
-

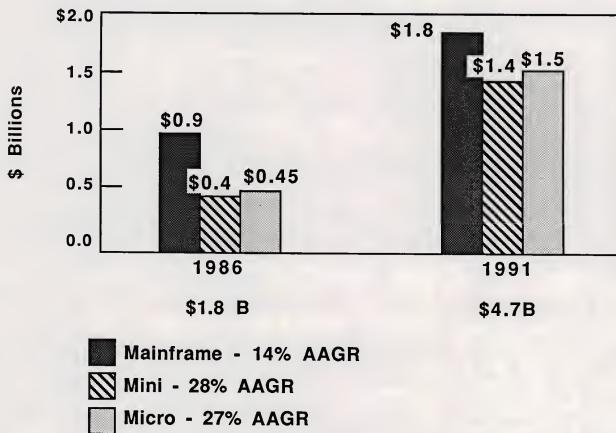


DBMS TRENDS

- Technology **→** Relational
 - Viability of Relational for Production Data Bases
 - SQL Standard
 - Expanding Role of Data Dictionary
-

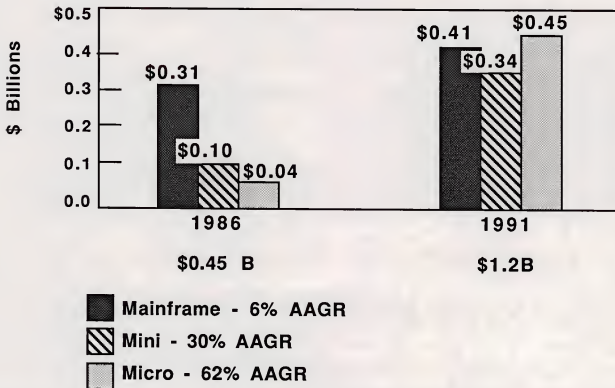


**DBMS - BY SYSTEM TYPE
1986-1991**





**PROGRAM DEVELOPMENT TOOLS (PDT)
BY SYSTEM TYPE
1986-1991**

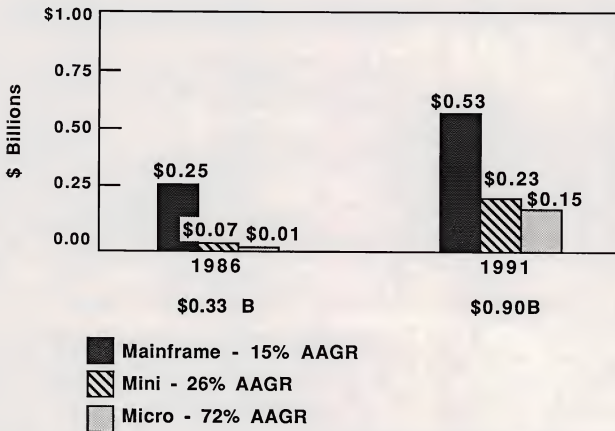


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**4GL - BY SYSTEM TYPE
1986-1991**





IBM ADT REVENUES

| | 1986 (\$ Millions) | 1991 (\$ Millions) | AAGR |
|-----------------------|-------------------------------|-------------------------------|-------------|
| DBMS Total | \$575 | \$1,900 | 19% |
| - IMS | 500 | 400 | -4% |
| - DB2/SQLDS | 75 | 1,400 | 68% |
| PDT (CSP,AS, etc.) | 150 | 525 | 28% |
| 4GL | 25 | 150 | 43% |
| Other | 100 | 220 | 17% |
| Total | \$850 | \$2,295 | 22% |



**U.S. DBMS MARKET LEADERS
1986 USER EXPENDITURES**

| | |
|--|-------------|
| IBM | 575 |
| ASHTON TATE | 200* |
| DEC | 100 |
| CULLINET | 81 |
| COMPUTER ASSOCIATES INTERNATIONAL | 63 |
| ORACLE | 60 |
| ADR | 54 |
| CINCOM | 40 |
| DATA GENERAL | 40 |
| UNISYS (SPERRY/BURROUGHS) | 40 |
| SOFTWARE AG | 39 |
| HEWLETT-PACKARD | 35 |

* Distribution Channel Markup Included

1875

Received of the Treasurer of the
Board of Education the sum of
\$100.00 for the year ending
June 30, 1875.

Witness my hand and seal this
10th day of July, 1875.

**U.S. 4GL MARKET LEADERS
1986 USER EXPENDITURES
(\$ Millions)**

| | |
|-----------------------------|-----------|
| Information Builders | 70 |
| Dun & Bradstreet | 55 |
| On-Line Software* | 40 |
| ADR | 32 |
| Cullinet | 22 |
| Software AG | 20 |
| Cincom | 18 |

*Acquired from Martin Marietta



**U.S. APPLICATION DEVELOPMENT SYSTEMS
MARKET LEADERS
1986 USER EXPENDITURES
(\$ Millions)**

| | |
|----------------------------|------------|
| IBM | 150 |
| Pansophic | 75 |
| ADR | 18 |
| Cullinet | 15 |
| Computer Associates | 8 |
| Software AG | 6 |

1918

Received of the
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CONCLUSIONS

- All ADT Segments Healthy
 - End Users Assume More of System Development Responsibility
 - IBM Key Market Player
 - Integration of Tools
-



CONCLUSIONS AND RECOMMENDATIONS

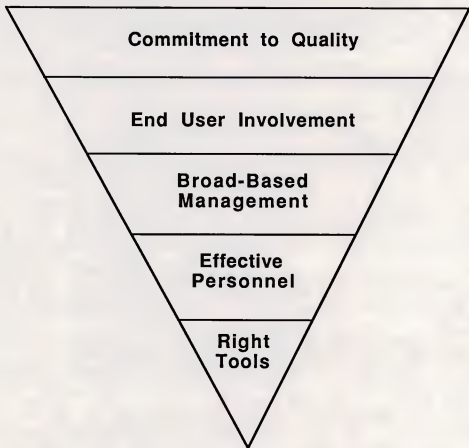


**SOFTWARE PRODUCTIVITY
UPS, DOWN, AND QUESTIONS**

- **Quality and Variety of Productivity Tools**
- **Use of Productivity Tools**
- **Confusion**
- **Misuse of Productivity Tools**
- **Performance**
 - **Hardware - Software (Mainframe)**
 - **Human - Machine Dyad**
 - **Work Unit**
 - **Institutional**
- **Forecasts**
- **Why**

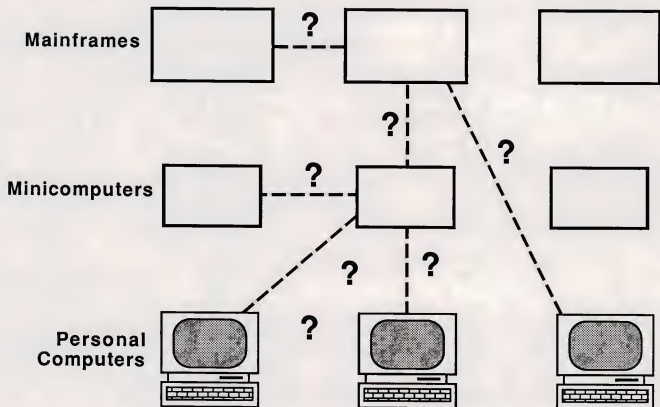


**THE PRODUCTIVITY PYRAMID
1980**





BACKWARDS





PRODUCTIVITY PLAN

- **Commitment to Quality**
 - **Hardware-Software**
 - **Human-Machine Dyad**
 - **Work Unit**
 - **Institutional**

 - **End User Involvement**
 - **The Right Tools**
 - **User Requirements***

 - **Broad-Based Management**

 - **Effective Personnel**

 - **Use Tools**
-



REQUIREMENTS BY PERFORMANCE LEVEL

- **Hardware-Software** —————→ **Network Management**
Performance Management
Privacy and Security

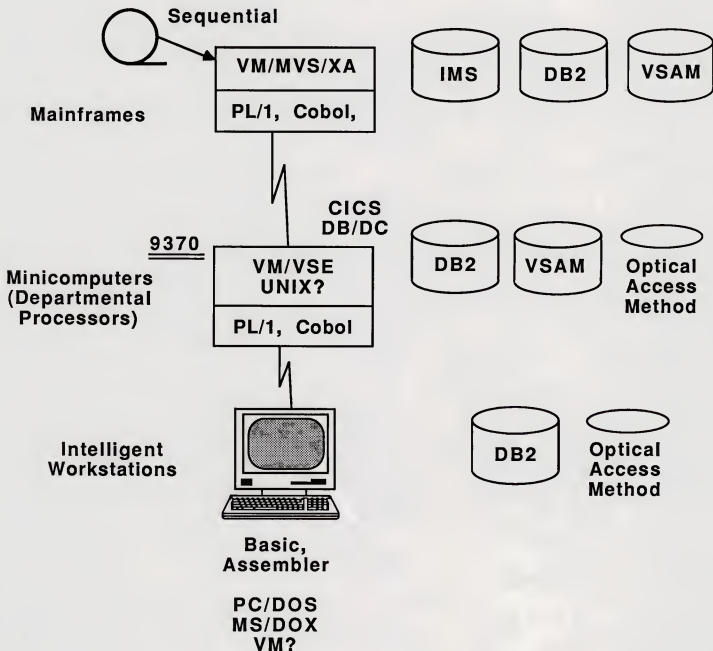
 - **Human-Machine Dyad** —————→ **Expert Systems**
Knowledge Base
Management

 - **Work Unit** —————→ **Document Control**
Information Flow
Media Replacement
(Paper —————→ Electronic)

 - **Institutional** —————→ **Data/Information/Knowledge**
 - Content
 - Integrity
 - Flexibility**Improved Modeling**
-



IADS NOT MAGIC, BUT . . .





RECOMMENDED CHANGES OF DIRECTION

- **Data Processing** → **Information Flow**
 - **Information Quantity** → **Information Quality**
 - **Automation of Process** → **Improved Process**
 - **Information Emphasis** → **Knowledge Emphasis**
 - **Tool & Application Builders** → **D/I/K Architects**
 - **Vendors & Systems Developers** → **Productivity Consultants**
-

1850

Received of the
Hon. Secy of the Navy
the sum of \$1000
for the purchase of
the ship "Albatross"
under the order of
the Hon. Secy of the Navy
dated the 10th day of
April 1850

Wm. A. Rorer
Treasurer